

NOAH C. GOLDSTEIN, Ph.D.

Spatial Scientist, LEED AP O+M
Scientific Lead for Site Sustainability
Energy Systems Section, Engineering Directorate
Lawrence Livermore National Laboratory
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SUMMARY OF QUALIFICATIONS-----

- Over 15 years' experience in applied and theoretical research, with over 10 peer-reviewed publications
- Expert in applied sustainability, the built environment, and informatics
- Instrumental in assisting a national laboratory secure additional year in its contract term, based on sustainability achievements across multiple functional areas
- Developed projects with multiple new government and corporate sponsors in areas of renewable energy, smart grid, wildfire analysis, building energy efficiency, and low-carbon energy solutions
- Developed internal research program that leverages R&D expertise to benefit on-site Sustainability performance

EDUCATION -----

Ph.D. Geography November 2005, UNIVERSITY OF CALIFORNIA, SANTA BARBARA
LLNL SEGRF Graduate Fellow

Certificate in Management Practice

Research focus: Human-environment interaction, geospatial complex systems modeling , urban modeling, wildfire modeling.

Complex System Summer School Summer 2001

SANTA FE INSTITUTE, SANTA FE NM

Coursework and projects in Coupled and Chaotic Systems

M.A. in Geography December 2000, UNIVERSITY OF CALIFORNIA, SANTA BARBARA

Research focus: Site suitability assessment of endangered species

B.A. in Biology August 1993 UNIVERSITY OF CALIFORNIA, SANTA CRUZ

Research focus: Interspecific competition between invasive and native species

EMPLOYMENT -----

LAWRENCE LIVERMORE NATIONAL LABORATORY

Engineering Directorate, Energy Systems Section 2010 - Present

Since 2010, I have had three major roles at LLNL:

- 1) Project Leader and Program Developer for Building Energy Efficiency
- 2) Scientific Lead for Site Sustainability
- 3) Project Leader for Energy Systems Informatics

The following are sample tasks and accomplishments for each role:

Project Leader and Program Developer for Building Energy Efficiency

In this role, I am coordinating program development in Energy Efficiency and developing analytical approaches to assess and implement energy efficiency in multiple sectors of the building industry.

Efforts include:

- Creation of Building analytics toolset, focusing on weather and building energy use
- Creation of metrics to measure programmatic progress for the of Energy Efficient Buildings Hub, a DOE-funded applied research Hub in Philadelphia
- Building Energy Efficiency lead for LLNL's "hpc4energy Incubator", an Industry-Lab research endeavor

Scientific Lead for Site Sustainability

- Developed new synergistic lines of collaborative research between multiple functional areas, using the LLNL site as a "Living Laboratory"
- Authored LLNL's Site Sustainability Plan (SSP) that describe achievements and plans towards the DOE Sustainability goals.
- Led and participated in Climate Change adaptation planning for the City of Livermore, DOE, and the LLNL Site
- Represented LLNL's interests with external audiences, including DOE, Private Industry, UC Campuses, and the City of Livermore
- Participated in LLNL's Environmental Management System and the LLNL Sustainability Communication Plan

Project Leader for Energy Systems Informatics

In this role, I am the lead on a number of efforts, including:

- Development of an informatics capability for energy projects
- Building Energy Efficiency lead for the "National Summit on Advancing Clean Energy Technologies" and the "hpc4energy incubator" proposal
- Advanced Computing Lead for CPUC-LLNL project for the California Investor-Owned Utilities
- Development of LLNL Solar Roadmap
- Assessment of the California state energy efficiency programs for the California Public Utilities Commission

REGENERATIVE VENTURES**Green Building Portfolio Advisor 2009**

- Created a Green Building Portfolio Assessment Program for real estate portfolio owners and managers to quantitatively improve the sustainable performance and operations of their building stock
- Developed a Green Building Marketplace Network, a business marketing and sales program, and the creation of a Green Building Company Assessment Tool.

CTG ENERGETICS

Director of Spatial Analysis, Director of Oakland Office 2008-2009

Analytic accomplishments included:

- Development of spatial analytic tools applied to assessing scenarios of energy demand of the built environment.
- Creation of a spatial Greenhouse Gas Assessment Protocol.
- Research collaboration with National Laboratories, Universities and government agencies.
- Energy and GHG scenario planning for new development
- Assessment of impacts of Climate Change at multiple scales

Director/Management accomplishments included:

- Opened a new branch office in a strategic region.
- Business development of spatial approaches to Sustainable Management.
- Marketing initiatives with multi-firm partnerships.
- Personnel management, including staff reviews and termination
- Office management and logistics
- Involvement in local sustainability nonprofits

LAWRENCE LIVERMORE NATIONAL LABORATORY

Spatial Mathematician

Engineering Directorate, System and Decision Sciences Section 2008

- Developed a temporally dynamic geospatial model of demographic change for the state of California, in support of a multidisciplinary Climate Change impact research program, as a research contract for the California Energy Commission "Scenarios 2008" integrated climate report.
- Assessed data for analysis in downscaled multinational Climate Change impact studies.

Postdoctoral Researcher

Engineering Directorate, System and Decision Sciences Section 2005-2008

- Investigated numerous spatial analytical modeling and research avenues, including Spatial Energy Demand Modeling, Wildfires, Water-Energy relationships, and Nuclear Affects Modeling.
- Creation of geospatial models for project deliverables fulfillment.
- Additional activities include proposal writing, budget management and mentoring of undergraduate students.

LLNL SEGRF Fellow 2003-2005

- Created a coupled Urban-Wildfire Risk Model merging GIS and Cellular Automata.
- Implemented coupled model for the Santa Barbara region, identifying regions of future wildfire risk.

UNIVERSITY OF CALIFORNIA, SANTA BARBARA, DEPARTMENT OF GEOGRAPHY 1999-2003

Graduate student researcher

- Grant: Modeling the Central Valley. Developed a Genetic Algorithm for the calibration for the SLEUTH urban growth model. Investigated indicators for sustainable growth.
- Grant: Urban Change - Integrated Modeling Environment. Modeled and analyzed urban growth histories, with respect to transportation and population densities.
- Grant: Biogeographical Modeling. Created an endangered species distribution model codifying expert knowledge and historical records.

LOS ALAMOS NATIONAL LABORATORY 2000-2001**Visiting researcher**

- Developed and implemented a spatial analysis of the use of the Internet in information dissemination during the Cerro Grande Fires of 2000.
- Analyzed the historical interactions between urban regions in California and fire-adapted vegetation.

UNIVERSITY OF CALIFORNIA, SANTA BARBARA, DEPARTMENT OF GEOGRAPHY 1998-1999, 2002**Teaching assistant**

Course titles included: "Introduction to Geographic Information Systems", "Production Cartography", and "Meteorology"

NATIONAL CENTER FOR ECOLOGICAL ANALYSIS AND SYNTHESIS (UCSB) 1997-1998**Graduate Student Researcher**

- Working group: "Automation of Ecological Data Management Using Structured Metadata".
 - Designed and wrote components of a new metadata tool, Ecological Metadata Language (EML).
 - Analyzed issues of metadata standards in the ecological and geographic community.
- Working group: "Designing and Assessing the Viability of Nature Reserve Systems at Regional Scales: Integration of Optimization, Heuristic and Dynamic Models".
 - Collated unique data sets of plant demographics, used for generalizing botanical life history metrics.

PEER-REVIEWED PUBLICATIONS AND BOOK CHAPTERS -----

Rohloff, A., Roberts, J., **Goldstein, N.C.**, 2010. "Impacts of Plug-In Hybrid Electric Vehicle Charging on Zero Net Energy Buildings and Communities". 2010 ACEEE Summer Study on Energy Efficiency in Buildings, August 15 - 20, 2010, Pacific Grove, California.

Sanstad, A.H., H. Johnson, **N.C. Goldstein**, G. Franco, 2009 "Long-Run Socioeconomic and Demographic Scenarios for California", California Energy Commission Report CEC-500-2009-013-D, <http://www.energy.ca.gov/2009publications/CEC-500-2009-013/CEC-500-2009-013-D.PDF>

Goldstein, N.C., 2008. "The Challenges to Coupling Dynamic Geospatial Models". Journal of Map & Geography Libraries, Vol. 4, No. 2, pp. 240-250.

N.C. Goldstein, R. Newmark, L. Burton, D. May, J. McMahon, C. Dunham-Whitehead and G. Ghatikar, 2008 "The Energy-Water Nexus and information exchange: challenges and opportunities". International Journal of Water, Vol. 4, nos. 1/2, pp. 5-24.

R.G. Pontius Jr, W. Boersma, J.-C. Castella, K. Clarke, T. de Nijs, C. Dietzel, D. Zengqiang, E. Fotsing, **N.C. Goldstein**, and others... 2008. "Comparing input, output, and validation maps for several models of land change". Annals of Regional Science, Vol 42, pp.11-37.

Kearns, F.R., **N.C. Goldstein**, B. Pedersen and M.A. Moritz, 2007. "The Fire Information Engine: A web-based toolkit for wildfire-related needs". Journal of Map & Geography Libraries, Vol. 4, No. 1, pp. 195-206.

Goldstein, N.C., 2007. "Coupled Spatiotemporal Simulation Modeling Explorations of Coevolving Systems". International Journal of Sustainable Development and World Ecology, Vol. 14, no. 1 (Feb.), pp. 37-51.

Clarke, K.C., N. Gazulis, C.K. Dietzel and **N.C. Goldstein**, 2007. "A Decade of SLEUTHing: Lessons Learned from Applications of a Cellular Automaton Land Use Change Model". in Classics from IJGIS: Twenty Years of the International Journal of Geographical Information Science and Systems, edited by Fisher, P., CRC Press. pp. 413-425.

Goldstein, N.C., 2005 "Brains vs. Brawn – Comparative Strategies for the Calibration of a Cellular Automata – Based Urban Growth Model". In GeoDynamics, edited by P. Atkinson, G. Foody, S. Darby and F. Wu, Taylor & Francis. pp. 249-272.

Goldstein, N.C., J.T. Candau and K.C. Clarke, 2004. "Approaches to simulating the "March of Bricks and Mortar". Computers, Environment and Urban Systems, Vol. 28: 125-147.

Herold, M., **N.C. Goldstein** and K.C. Clarke 2003. "The spatio-temporal form of urban growth: measurement, analysis and modeling". Remote Sensing of Environment, Vol. 86(3): 286-302.

OTHER PUBLICATIONS, PRESENTATIONS AND INVITED TALKS -----

Goldstein, N.C., 2013. "Making an Impact: Sustainability, Resilience, and the Power of Information," 3rd Annual Conference on Sustainable Real Estate, New York University, Panel member.

Goldstein, N.C., 2012. "The 'computational revolution' – how high performance computation will change industry." Sustainable Industries,
<http://sustainableindustries.com/articles/2012/05/processing-power>

Goldstein, N.C., 2012. "The Livermore Energy Systems Informatics Capability" Various Audiences

Goldstein, N.C., 2012. "The Value of Metrics in Assessing Progress", DOE Energy Efficiency Building Hub, Philadelphia, PA.

Goldstein, N.C., 2011. "The hpc4energy incubator" California Clean Tech Innovation Conference, Oakland, California, Invited Talk

Goldstein, N.C., 2011. "Sustainability at LLNL: Achieving Goals and Advancing Science", Invited talk, FMA Progressive Energy, Environment and Sustainable Congress, Weston, FL.

Goldstein, N.C., 2011. "Opportunities and Challenges in the Energy-Water Nexus", Invited talk, UC Merced School of Engineering Advisory Board

White, W., Camp, D.W., **Goldstein, N.C.**, Hunter, S., 2011. "A Concise Review of UCG Environmental Hazards", Invited talk, US Department of Interior's Office of Surface Mining Reclamation and Enforcement

Goldstein, N.C., Camp, D.W. 2011. "Site Suitability for Underground Coal Gasification", Invited talk, Turkish Coal Enterprises, Ankara, Turkey

Goldstein, N.C., 2011. "Renewables Innovation and Development for Generation of Electricity (RIDGE) at LLNL's Site 300" NNSA Scientific Transformation Team Meeting, Livermore, CA

Goldstein, N.C., 2010. "Lawrence Livermore National Laboratory 2010 Sustainability Leadership Strategy: In Fulfillment of Performance Evaluation Plan Stretch Target 11.6.4." Internal LLNL Document.

Shultz, K., Pyke, C., and **Goldstein, N.C.**, 2010. "Energy Flows in Homes", Greenbuild, USGBC Research Poster Session. Chicago, IL.

Goldstein, N.C., 2010. "Satisfying Water Demand in the Heat of Climate Change", Panel Member, UC Berkeley Energy Symposium. Berkeley, CA, March 2010.

Goldstein, N.C., 2010. "The Energy-Water Nexus Smart Grid / Smart Meter Integration". Connectivity Week, San Jose, CA, May 2010.

Goldstein, N.C., Pyke, C.P., 2009. "Just over the horizon: Challenges and Opportunities of Climate Action Plans". How Energy, Carbon, and Water Legislation Impact the Building Industry, SMUD Seminar, April 2009.

Goldstein, N.C., Pyke, C.P., 2009. "Developing the Next Generation of Climate Action Plans", ESRI Annual Users Conference, Sand Diego, CA, July 2009.

White, R.G., **N.C. Goldstein**, S. Yeh, 2008. "Finding the Value of Water in a Hydrogen Economy", National Hydrogen Association Annual Meeting, Sacramento, CA, April 2008.

Goldstein, N.C., 2007. "Spatial scale and Energy: Models, Processes, and Human Behavior" Annual Meeting of the Association of American Geographers, Las Vegas, CA, April 2009. Panel Discussion.

Pontius, R.G., **Goldstein, N.C.**, and others, 2007. "Lessons and challenges in land change modeling as revealed by map comparisons." Proceedings of the conference on the science and education of land use. Washington DC, USA 37p.

Goldstein, N.C., R. Newmark, E. Burton, D. May, J. McMahon, C. Dunham Whitehead and G. Ghatikar, 2007 "Data Sharing and Security Perspectives in the Energy-Water Nexus" Annual Water Resources Conference, Albuquerque, NM, November 2007.

Goldstein, N.C., 2007. "Comparative methods for analysis of Monte Carlo binary output of spatial spread models: applications and extensions", Seventh Biennial Tri-Laboratory Engineering Conference, Albuquerque, NM, May 2007.

Goldstein, N.C. R. Newmark, E. Burton, D. May, J. McMahon, C. Dunham Whitehead and G. Ghatikar "Data and Modeling Conflation Issues in Energy and Water Systems" First Western Forum on Energy & Water Sustainability, Santa Barbara, CA. March 2007.

Goldstein, N.C., 2007. "Current GeoSpatial Energy Supply and Demand Modeling - Challenges and Opportunities" Annual Meeting of the Association of American Geographers, San Francisco, CA, April 2007.

Goldstein, N.C., 2006. "Geospatial Modeling and Analysis for Infrastructure Vulnerability: An Overview of the Systems and Decision Science Group". Homeland Infrastructure Foundation-Level Database Working Group Conference, Santa Fe, NM, April 2006.

Goldstein, N.C., 2006. "A new methodology of comparing Monte Carlo binary output of spatial spread models" Annual Meeting of the Association of American Geographers, Chicago, IL, March 2006.

Pontius, R.G., **N.C. Goldstein**, B. Pijanowski, and W.J. McConnell, 2006. "Current progress in dynamic land change modeling" Annual Meeting of the Association of American Geographers, Chicago, IL, March 2006. Panel Presentation.

Moritz, M. A., M. Kelly, F. Kearns, P. Frontiera, C. Cleve, J. Sapp, S. Waite, S. and **N.C. Goldstein**, 2006. "A WebGIS Decision-Support Tool for Parcel-Based Fire Hazard Assessment in California" Annual Meeting of the Association of American Geographers, Chicago, IL, March, 2006.

Goldstein, N.C., M.A. Moritz, F. Kearns, 2006. "Dynamic Wildfire Risk Mapping: Challenges and Solutions", ESRI Annual Users Conference, Sand Diego, CA, August 2006.

Goldstein, N.C., 2005. "A Formalization of Spatial Spread", GeoComputation 2005, Ann Arbor, Michigan, August 2005.

Goldstein, N.C., C. Dietzel, and K.C. Clarke, 2005. "Don't Stop 'Til You Get Enough - Sensitivity Testing Of Monte Carlo Iterations For Model Calibration", GeoComputation 2005, Ann Arbor, Michigan, August 2005.

Peterson, S., **N.C. Goldstein**, M. Clark, K. Halligan, P. Schneider, P. Dennison, and D. Roberts, 2005. "Sensitivity Analysis of the 2003 Simi Wildfire Event", GeoComputation 2005, Ann Arbor, Michigan, August 2005.

Goldstein, N.C., 2004 "A Methodology for Tapping into the Spatiotemporal Diversity of Information in Simulation Models of Spatial Spread", GIScience 2004, Adelphi, Maryland, October 2004.

Candau, J.T. and **N.C. Goldstein**, 2002. "Multiple Scenario Urban Forecasting for the California South Coast Region" Proceedings of the Urban and Regional Information Systems Association (URISA) 40th Annual Conference, Chicago, IL, October 2002.

Herold, M., **N.C. Goldstein**, G. Menz, and K.C. Clarke, 2002. "Remote Sensing based analysis of urban Dynamics in the Santa Barbara region using the SLEUTH urban growth model and spatial metrics", Proceedings of the 3rd Symposium on Remote Sensing of Urban Areas, June 2002, Istanbul, Turkey.

Goldstein, N.C., 2002. "The Message is in the Context: Information translation and network coupling." The First Lake Arrowhead Conference on Computational Social Science and Social Complexity. Lake Arrowhead, CA, May 2002. Invited talk.

Goldstein, N.C., 2002. "Using a Genetic Algorithm as an alternative method of SLEUTH Calibration". Annual Meeting of the Association of American Geographers. Los Angeles, CA, March 2002.

Goldstein, N.C., 2001. "Self-Organized Websites for Evacuees from the 2000 Cerro Grande Wildfire" Sackler Colloquium on Adaptive Agents, Intelligence and Emergent Human Organization: Capturing Complexity through Agent-Based Modeling. Organized by the National Academy of Sciences, October 2001.

Goldstein, N.C., J. Candau, and M.A. Moritz. 2000. "Burning Santa Barbara at Both Ends: a study of fire history and urban growth predictions" 4th International Conference on Integrating GIS and Environmental Modeling (GIS/EM4). Banff, Canada, September 2000.

Goldstein, N.C., 2000. "Do Cities Learn From Getting Burned?" Artificial Life 7 Workshop Proceedings, Edited by C.C. Maley and E. Boudreau. Portland Oregon. August 2000. pp. 136-138.

Pyke, C.R., P.S. Alagona, B. Bierwagen, J. Gallo, **N. C. Goldstein**, J. Merrick and H. Rosenberg, 1999. "A plan for outreach: Defining the scope of conservation education", Conservation Biology, vol. **13**, no. 6, pp. 1238-1239.

Goldstein, N.C., 1999. "Modeling the potential distribution of rare plant species of the Santa Monica Mountains National Recreation Area using a fuzzy-logic/knowledge base approach", Idaho Cooperative Fish & Wildlife Research Unit, 1999 Modeling Symposium, Predicting Species Occurrences: Issues of Scale and Accuracy. Snowbird, Utah.

Pyke, C.R., B. Bierwagen, **N.C. Goldstein**, 1998. "Strange bedfellows: Observations on the current relationship between Recovery Plans and Habitat Conservation Planning", Endangered Species UPDATE, Vol. 15, no.6, pp. 97-105

Jones, M.B., Z.Wang and **N. C. Goldstein**, 1998. "Ecological Metadata Language, Version 1.3", Source code location: <http://www.nceas.ucsb.edu/nceas-web/results/projects/97NCEAS2/eml-1.3> .

HONORS AND AWARDS -----

2012 LLNL Individual Performance Bonus Award

2006 SECOND PLACE, Spatial Analysis and Modeling Specialty Group of the Association of American Geographers Paper Competition

2005 Post-Doctoral Award, US Environmental Protection Agency's Office of Research and Development Cross-ORD Interdisciplinary Post-Doctoral Research Program (Declined)

2000-2005 Awards to travel and present at professional conferences from:

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|--------------------------------|---|
| • Jack and Laura Dangermond | • National Academy of Sciences |
| • UCSB Department of Geography | • Seventh International Conference on Artificial Life |
| • ESRI | • National Science Foundation |
| • UCSB Graduate Division | |

2003 SEGRF Fellowship, Lawrence Livermore National Laboratory

2001, 2000, 1998 Research Fellowship, UCSB Department of Geography

1999, 1998 Teaching Fellowship, UCSB Department of Geography

1998 Reichman Research Fellowship, National Center for Ecological Analysis and Synthesis

1992 Thesis Development Grant, UCSC Department of Biology

REVIEWS -----

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| ▪ Computers and Geosciences | ▪ Remote Sensing of Environment |
| ▪ Computers, Environment and Urban Systems | ▪ Annals of the Association of American Geographers |
| ▪ International Journal of GIS | ▪ Greenbuild Conference |
| ▪ Landscape and Urban Planning | |

RELATED ACTIVITIES-----

- Member, UC Merced's School of Engineering's Advisory Board
- Member: SPUR working group on Strategies to impacts of Climate Change in the Bay Area

- Member: Urban Land Institute (ULI) San Francisco District Council Sustainability Subcommittee
- Founding Member: San Francisco Carbon Collaborative

AFFILIATIONS and CERTIFICATES-----

- LEED Accredited Professional (LEED AP+O&M)
- Certificate in Management Practice (2005) from the University of California, Santa Barbara